A Focused Review of the Reengineering Literature: Expert Frequently Asked Questions (FAQs)

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ABSTRACT

Business Process Reengineering (BPR) is said to be entering its second phase. In its first phase, many disparate methodologies for process redesign were developed and employed, and BPR became a pervasive and important phenomenon in the fast-paced global economy. The second phase promises to be more challenging than the first, particularly as the reengineering phenomenon continues to have negligible theoretical basis. As we progress to take-on the challenges of reengineering's second phase, it is important for the academic and practitioner communities to learn from the lessons of phase one. Toward this end, this article includes a focused review of the reengineering literature, with the purpose of circumscribing the best practices and integrating the lessons learned. Drawing primarily from expert reengineering methodologies, the key lessons learned in phase one are presented in terms of Frequently Asked Questions (FAQs). These FAQs provide the basis of some integrating themes, from which an outline of a number of future-research directions is drawn.

KEYWORDS Change management, process modeling, total quality management, reengineering methodology.

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SECOND PHASE OF REENGINEERING

Business Process Reengineering (BPR) is said to be entering its second phase (Cypress 1994). Through the approximate half-decade of its first phase, many disparate methodologies for process redesign were developed and employed, and a multitude of reengineering books (e.g., Davenport 1993; Hammer and Champy 1993) were published in the management press and widely read. During this time, nearly all large U.S. corporations engaged in major reengineering projects, and more than half of the annual reports to stockholders by *Fortune 500* companies addressed BPR activities in 1994 (Hamscher 1994).

In this first phase, the rise and fall of BPR in the trade press occurred, as the topic progressed from a state of perennial hype in the early Nineties (e.g., Anderson 1991; Currid 1994; Manager's Notebook 1994) only to be superseded by today's focus upon topics such as the Internet, "Intranets," Java, and the like (e.g., Wilder 1995; Wilder et al. 1995; Marshall and Rodriguez 1995). A number of academic investigations were conducted to study the reengineering phenomenon (e.g., Stoddard and Jarvenpaa 1995), which exposed a number of "myths" (Davenport and Stoddard 1994) in addition to outlining many "preconditions for success" (Bashein et al. 1994).

The second phase promises to be more challenging than the first, particularly as the reengineering phenomenon continues to have negligible theoretical basis (Saharia et al. 1994). Described in terms of a shift from "customer value chain" analysis to a paradigm of "wealth creation and consumption" (Cypress 1994), the second phase will require more knowledge, better understanding, and more context-sensitive methodologies (Nissen 1996) in order to avoid the same magnitude (e.g., 50-75%) of failure rates (Caron et al. 1994; Hammer and Champy 1993) ascribed to phase one.

As we progress to take-on the challenges of reengineering's second phase, it seems important for the academic and practitioner communities to learn from the lessons of phase one. Despite the dearth of *theoretical* work on BPR, many *practical* lessons have been reported in the reengineering literature (e.g., Hammer and Stanton 1995), which can provide a basis for documenting current understanding of this field. Toward this end, this article includes a focused review of the reengineering literature, with the purpose of circumscribing the best practices and integrating the lessons learned. The article draws primarily from a segment of this literature described as the expert reengineering methodologies, which probably represents the best, clearly-articulated accounting of the BPR phenomenon.

This paper begins with a literary framework to help organize the key reengineering publications, and then the key lessons learned in phase one are presented in terms of Frequently Asked Questions (FAQs), which provide the basis of some integrating themes. The article closes with some conclusions and future-research directions to help prepare for the second phase of reengineering.

REENGINEERING LITERARY FRAMEWORK

Frameworks can be very helpful in terms of organization. Provided that the underlying dimensions are informative, a reengineering framework should be able to impose order upon the unruly body of reengineering literature, and create a classification scheme which can be used, modified, and extended by other researchers. The reengineering literary framework described in this section provides a step toward these goals, and represents an extension of the scheme proposed by Nissen (1995, Chapter 2).

The central dimension of this framework is referred to as *knowledge content*. Knowledge content refers to the amount of substantive knowledge conveyed by a publication, which can be crudely operationalized in terms of the kinds of questions that can be answered through such knowledge (see Bacharach 1989). With this, the reengineering literature can be categorized (in increasing order) according to five classes: 1) the Trade Press, 2) Redesign Cases, 3) Expert Reengineering Methodologies, 4) Academic Investigations, and 5) Theory-Building Works. This framework is summarized in Table I.

Table I Reengineering Literary Framework

Class of Publication	Principal Questions Addressed
Trade Press	Answers the question *huh*?
Redesign Cases	Describe *who* and *which*
Expert Reengineering Methodologies	Motivate *whether* and prescribe *what*
Academic Investigations	Describe *how*
Theory-Building Works	Explain *why* and predict *when*

As alluded to above, the trade press follows contemporary phenomena and technologies (e.g., Middlebrook 1994), more often through hyperbole and speculation than knowledge and fact (see McPartlin 1993). Indeed, many would question inclusion of publications in this class as "literature," as many articles do little more than alert the reader to the existence, prominence, or importance of a topic (e.g., Champy 1990). Such articles might be described in terms of answering the question *huh*? They are generally very shallow in coverage of a topic, and the content contributes very little in terms of specific knowledge; hence the placement at the "low" end of the knowledge-content continuum.

A number of process redesign cases have been reported by various sources. Many such cases are used for educational purposes (e.g., Goldstein 1986; King and Konsynski 1990; Stoddard and Meadows 1992), while others serve as exemplars of effective reengineering techniques and technologies (e.g., Hammer and Champy 1993, pp. 36-46; Hammer and Stanton 1995, pp. 187-289; Talebzadeh et al. 1995). Cases of process redesign provide more information to answer questions such as *who* is reengineering? and *which* processes are involved? However, because cases are generally of a purely-descriptive nature, little is gained in the way of knowledge beyond increased understanding of a particular instance of process redesign.

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Alternatively, the expert reengineering methodologies reflect a synthesis of many process redesign endeavors, and are generally developed by BPR consultants who are widely acknowledged as the most knowledgeable experts in the field. Admittedly, some of these "methodologies" (e.g., Hammer and Champy 1993) appear to accomplish little more than motivating the case for BPR (Cole 1994), and are shown to have substantial room for improved analysis (Hansen 1994); in essence they answer the question of *whether* to reengineer. However, others (e.g., Davenport 1993) provide a start-to-finish guide to undertaking process improvement, answering questions such as *what* steps need to be taken and in which order. As noted above, the expert reengineering methodologies from this class provide the basis for the expert FAQs discussed in the following section.

Because knowledge-creation represents a fundamental objective of academic investigation, and academics are trained in the methods of defensible, extensible, and replicable research, publications in this class are positioned near the "high" end of the reengineering literary framework. In many ways, academic investigations build upon the kind of knowledge available through expert reengineering methodologies--for example contributing knowledge in terms of frameworks (e.g., Davidson 1993; Guha et al. 1994) and guidelines (e.g., Henderson and Venkatraman 1993; Klein 1994) that begin to answer operationalized questions such as *how* to accomplish the redesign steps from above.

In this article, academic investigations that contribute toward theory-building are listed at the extreme along this dimension. The corresponding explanatory and predictive knowledge can be used to answer the most difficult questions such as *why* a given enabling technology was successful in a certain instance, and *when* a particular redesign intervention can be expected to be effective for a specific organizational process. Unfortunately, the list of publications belonging to this class is very, very short.

EXPERT BPR FAQs

From its very likely beginning in the computer software industry, the FAQ (i.e., frequently asked question) file has become commonplace in both business and academics as an efficient method of knowledge transfer. Whether one is interested in learning about new software (e.g., JAVA 1996), technology (e.g., PowerBrowser 1996), or emerging phenomena such as electronic commerce (E-Commerce 1996), FAQ files are readily available and represent an excellent source of information with which to begin an investigation. That is the primary purpose of this paper.

The "questions" themselves that are addressed by the FAQs that follow are determined primarily through participation in a number of reengineering and quality newsgroups, and summarized in part through an informal poll of colleagues. Although in no way intended to be comprehensive, the "answers" below should serve to address many of the common questions pertaining to the phenomenon of BPR. Moreover, by drawing from the reengineering literature, these answers take-on a variety of perspectives, and represent the knowledge and practice articulated by some of the best recognized authorities on process redesign. The questions and answers follow.

FAQ 1 - What Are the Key Terms and Concepts?

The reengineering literature represents an important source of terms and concepts. The term *reengineering* itself has been defined as ". . . the *fundamental* rethinking and *radical* redesign of business *processes* to achieve *dramatic* improvements in critical, contemporary *measures* such as cost, quality, service, and speed [emphasis added]" (Hammer and Champy 1993, p. 32). The "fundamental" nature of reengineering relates to questioning assumptions; that is, taking nothing about a business or organization as fixed or given, and challenging the appropriateness and existence of every aspect of business organization and operation. This is closely related to the accounting notion of *zero-based budgeting* (Cheek 1977) that was popular in the Seventies.

"Radical" redesign refers to transforming even the most enduring, stable, and central aspects of a process design configuration, and envisioning new redesign alternatives without limitations or constraints associated with a current design. "Dramatic" improvement implies that the level of performance can increase by several fold (e.g., 2x, 5x), as opposed to marginal improvements that are generally measured in percentages (e.g., 5%, 20%).

The "measures" from above are associated with outputs, in terms of performance, as opposed to inputs to a business or organization. One issue relates to the fact that many outputs appear to be closely aligned, while others are surely oblique and orthogonal. For example, cost and cycle time (i.e., speed) appear to be closely related (Stalk and Hout 1990), as a reduction in cycle time corresponds to a decrease in allocated fixed or period costs, which can also enable an increase in throughput or production. However, the relationship between cost (and cycle time) and quality or service is less clear.

For example, a common TQM precept suggests that improvements in quality correspond to reductions in cost through the reduction of rework, returns, service, etc. Alternatively, higher quality output often requires the use of more expensive labor, materials, and technology, which clearly correspond to higher costs. Further, superior quality and service represent techniques used for a strategy based on differentiation (Wiseman 1988), which is not generally associated with a cost-based strategy (Porter 1980). It seems clear that the "success" of a reengineering project will necessarily depend upon both the strategy being pursued and the output being measured.

Table II Key Reengineering Concepts

Topic	Concept
Reengineering	Fundamental rethinking, radical redesign, process, dramatic improvement, measures, return, risk
Process	Activities, customers, measures, work ordering, time,

	space, beginning, ending, inputs, outputs, structure, action, baseline
Redesign	Process configuration, design flaws, process transformation

Finally, from this definition, the "process" represents the central unit of analysis. The term *process* has been loosely defined as ". . . a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer" (Hammer and Champy 1993, p. 35). From this definition, *activities, outputs, customers*, and *measures* represent key concepts associated with processes. A similar definition appears in Davenport (1993, p. 5): "In definitional terms, a process is simply a structured, measured set of activities designed to produce a specified output for a particular customer or market." A related definition is found on p. 2: "A process is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action." This latter definition helps to identify additional key concepts, including *ordering of work, time, space, beginning, ending, inputs, outputs, structure,* and *action*. These concepts are useful for building knowledge. Table II provides a summary of the key reengineering concepts identified in this section.

FAQ 2 - How Does BPR Differ from TQM?

Based on this review of the literature, probably the most distinguishing feature between BPR and TQM is a matter of degree. This view is largely consistent with that expressed in (Cole 1994, p. 81), in which an "extraordinarily large number of similarities between quality and re-engineering" is asserted. From the key terms and concepts above, the emphasis of the former is on singular and dramatic performance improvement through radical process redesign (Barnett 1994; Scherr 1993; Ward 1993), whereas more continuous and incremental gains are generally expected through the latter (Flood 1993;

Hoffherr et al. 1994; Stein 1993). This view is echoed in Hammer and Champy (1993, p. 49): whereas ". . . quality programs and reengineering share a number of common themes" on the one hand, these authors also state that "the two programs differ fundamentally" and contrast the continuous, incremental nature of TQM with discrete, quantum effects of BPR.

The foundations of BPR are clearly set in TQM according to Harrington (1991), and, in building upon this work, we are advised to ". . . combine process improvement and process innovation in an ongoing quality program" (Davenport 1993, p. 14). Alternatively, this same author describes the "pace of change" as much more dramatic in a reengineering project. A similar contrast also exists in Andrews and Stalick (1994), but their eight-step reengineering approach concludes with the transition to a CPI (i.e., continuous process improvement) environment.

However, there appears to be nothing in these expert reengineering methodologies that would prevent the gains achievable through CPI from becoming dramatic (i.e., of the same order as those sought through BPR); neither would radical process redesign appear to ensure that improvements will exceed incremental levels (i.e., as BPR authors generally attribute to TQM), or even be positive for that matter. Analogous to the well known risk-return relationship captured in the Capital Asset Pricing Model (Sharpe and Alexander 1990), we are cautioned that "the risks of process innovation are at least proportional to the rewards" (Davenport 1993, p. 15); from the high BPR failure rates noted above, this suggests that reengineering represents a more aggressive, but riskier, performance-improvement endeavor than TQM.

The focus of measurement also differs in terms of emphasis between the BPR and TQM literatures. TQM publications, with their emphasis on CPI (Lynch and Cross 1991; Steeples 1993) and Activity-Based Costing (Brimson 1991; O'Guin 1991), appear to reflect a relatively straightforward extension of traditional Industrial Engineering works such as (Bailey 1982; Barnes 1980). Some experts draw a contrast between this and "the new industrial engineering" (Davenport and Short 1990), in which the enabling power of IT is stressed; the role of IT in reengineering represents the subject of FAQ 5 below, but ex-ante process modeling (Curtis et al. 1992; Housel et al. 1993), complexity assessment (Albrecht and Gaffney 1983; Dreger 1989; Kanevsky and Housel 1994), and performance evaluation (Grady 1992; Nissen 1994) take-on key importance in BPR.

To reiterate, differences between BPR and TQM may be best characterized in terms of degree (e.g., singular vs. continuous activity, dramatic vs. incremental improvement objectives, radical vs. "fine tuning" process redesign, etc.). It would also appear that researchers in each area may have much to gain from their counterparts in the other. This point highlights one of the intended contributions of this article: to capture and organize a major segment of the reengineering literature for the benefit of researchers in BPR, TQM, and other, relevant disciplines (e.g., Information Systems).

FAQ 3 - Why Reengineer Organizational Processes?

"The Crisis that Will not Go Away" is the title of Chapter 1 in Hammer and Champy (1993), in which the authors describe three forces that are driving companies to reengineer organizational processes: 1) customers taking charge, 2) competition intensifying globally, and 3) change perpetuating and increasing in pace. In addition to these external forces behind reengineering, the authors also highlight a problem internal to business processes themselves (p. 11):

> Most companies today--no matter what business they are in, how technologically sophisticated their product or service, or what their national origin--can trace their work styles and organizational roots back to the prototypical pin factory that Adam Smith described in *The Wealth of Nations*, published in 1776.

Despite our common usage of the term *re-engineering*, such work styles and organizational roots do not appear to have been *engineered* to begin with; rather, this suggests that organizational processes are merely continuations of their predecessors, having evolved slowly and, in many cases, changed little through the decades (and centuries). Even if business processes had been engineered to begin with, say only ten or twenty years ago, a strong case could still be made for their re-engineering, particularly in light of "the tool that has changed business most over the past three decades--information technology" (Davenport 1993, p. 5). Not unlike the advent of electrical power near the turn of the century, information technology (IT) can enable entirely new methods of performing work.

Further, as noted in the first section, reengineering has become very pervasive and important in business. The fact that nearly all U.S. corporations are undertaking major reengineering projects implies that a given company, which fails to reengineer, may fall behind simply by standing still. Management is adduced to simplify and streamline processes, and to employ "breakthrough strategies" to effect error-free and world-class levels of process performance (Harrington 1991, p. 206). Management is also exhorted to strive for "breakpoint strategies" for renewed competitiveness and competitive dominance (Johansson et al. 1993, p. 119); here, the authors define a *breakpoint* as ". . . the achievement of excellence in one or more value metrics where the marketplace clearly recognizes the advantage, and where the ensuing result is a disproportionate and sustained increase in the supplier's market share (p. 113). In terms of the Competitive Forces Model (Porter 1985), not only does reengineering represent a threat from rival firms in a competitive arena, but BPR can also be characterized as an approach to the attainment of sustainable competitive advantage. Indeed, we have evidence that a number of companies view reengineering itself among their essential core competencies. Such companies include Cigna (Caron et al. 1994) and Taco Bell (Karlgaard 1994), for example.

FAQ 4 - What Reengineering Steps Are Required?

Each of the expert reengineering methodologies is comprised of a somewhat different sequence of redesign activities or steps, which reflects differing emphases across the various methods. For example, one of the earliest of these (Rummler and Brache 1991) includes an analytical technique that helps one to focus upon who (i.e., what organizational role) is responsible for what (i.e., which process activities). Specifically, it involves a two-dimensional technique for process mapping, which builds upon the standard (one-dimensional) flowcharting approach employed in most methodologies; with this, the typical flowchart sequencing of tasks and activities is extended to incorporate the second dimension of organizational role; that is, it explicitly links process activities to the organizations and roles responsible for their execution.

As noted above, another early expert reengineering methodology (Harrington 1991) has its focus upon process simplification and streamlining, and involves five steps: 1) organize for improvement; 2) understand the process; 3) streamline; 4) measure and control; and 5) continuous improvement (p. 21). As should be apparent from steps 2 and 4, this methodology places considerable emphasis on the understanding and measurement of an existing process baseline, to which some refer as the "as-is" condition or configuration. A similar emphasis on the baseline process configuration is found in the later methodology of Davenport (1993). This methodology outlines a sequence of five high-level activities, which are listed in Table III (p. 25), and highlights the importance of information pertaining to an existing process through step 4.

Table III High Level Reengineering Activities

Step	Activity
1	Identifying process for innovation
2	Identifying change levers (i.e., enabling technologies)
3	Developing process visions
4	Understanding and improving existing processes
5	Designing and prototyping the new process

This emphasis provides a stark contrast with the methodology of Hammer and Champy (1993), the latter of which involves "starting all over, starting from scratch" (p. 2). Indeed, in this latter methodology, analysis of an existing process baseline configuration is purposefully excluded, including instead only a high-level understanding of "the what and the why, not the how, of the process" (p. 131). In a related work (Hammer and Stanton 1995, p. 19) the rationale provided is that ". . . the how is going to change anyway as a result of reengineering." The authors refer to this reengineering approach as "redesign with a blank sheet of paper" (p. 131) and "the proverbial clean slate" (p. 4). The importance of baseline process analysis represents a major issue of division between the expert reengineering methodologies.

Returning to the methodology of Davenport (1993), each of the five high-level reengineering activities can be decomposed into a set of lower-level activities. Focusing, for example, upon the elements of process *redesign*, steps four and five detail the requisite reengineering activities. Table IV contains a listing of the second level activities corresponding to steps four and five (p. 139 and 154). Through its inclusion of baseline process analysis and measurement, this methodology effectively subsumes that of Harrington (1991) above, and it is quite comprehensive. However, although this present framework effectively prescribes *what* reengineering activities to perform, and in which order they should be accomplished, it fails to describe *how* to perform them (i.e., is not operationalized). This represents a common theme that pervades the expert reengineering methodologies, a theme which was explicitly incorporated into the reengineering literary framework above.

Table IV Critical Redesign Activities

Phase	Redesign Activity
4 - Understanding and	1. Describe the current process flow

improving existing processes:	
	2. Measure the process in terms of the new process objectives
	3. Assess the process in terms of the new process attributes
	4. Identify problems with or shortcomings of the process
	5. Identify short-term improvements in the process
	6. Assess current information technology and organization
5 - Designing and prototyping a new process:	1. Brainstorm design alternatives
	2. Assess feasibility, risk and benefit of design alternatives
	3. Select the preferred process design
	4. Prototype the new process design
	5. Develop a migration strategy
	6. Implement new organizational structures and systems

A subsequent methodology (Andrews and Stalick 1994) also outlines a multi-step sequence of reengineering activities. Unlike its counterparts above, greater emphasis is placed on implementation, as opposed to redesign. Implementation represents a key stage of activities in the reengineering life cycle (Guha et al. 1994), and represents a major area of risk in terms of BPR success. The eight steps are listed in Table V. As noted above, this methodology calls for transition to a CPI environment. Such institutionalization of process improvement is also noted as important in Davenport (1993, p. 14): "Lest it slide back down the slippery slope of process degradation, a firm should then pursue a program of continuous improvement for the post-innovation process." Again, the consensus among reengineering experts suggests that BPR and TQM are both compatible and complementary.

Table V Eight Step Approach

Step	Activity
1	Frame the project
2	Create vision, values and goals
3	Redesign business operations
4	Conduct proof of concept
5	Plan implementation
6	Get implementation approval
7	Implement redesign
8	Transition to CPI environment

FAQ 5 - What is the Role of Information Technology?

As noted above, information technology has had a profound effect on business. For a number of years researchers have investigated the role of IT in BPR (e.g., Smith and McKeen 1993; Teng et al. 1992), employed IT-based analytical techniques (e.g., Daniels et al. 1991; Dennis et al. 1993), and developed frameworks to characterize reengineering in terms of how IT is strategically employed (e.g., Ives et al. 1993; Venkatraman 1994). In the expert reengineering methodologies, IT is consistently described as *the central* enabling technology for process redesign.

For example, IT is called the "*essential enabler*" in reengineering (Hammer and Champy 1993, p. 83), and management is urged to "think inductively" (p. 84) about how IT can be employed for process redesign. Such inductive thinking begins with known (information) technologies, such as those listed in Table VI (pp. 91-101), which managers use to identify problems that the technologies can help to solve.

Although the authors caution against an over-reliance on IT in reengineering--colorful terms such as *automating the mess* and *paving the cowpaths* have been used (Hammer 1990) to describe this situation--it is clearly central to their methodology.

Table VI IT Enablers

Example	Enabler (i.e., transformation technology)
1	Shared databases
2	Expert systems
3	Telecommunications networks
4	Decision support tools
5	Wireless data communication and portable computers
6	Interactive videodisk
7	Automatic identification and tracking technology
8	High performance computing

IT also plays a key role in the methodology espoused in (Davenport 1993): ". . . information technology [is] . . . the most powerful tool for changing business to emerge in the twentieth century." However, this author also acknowledges the importance of other enabling or transformation technologies (p. 13), to which he refers as "human and organizational development approaches." This mirrors a key concept from Information Systems that dates back to the early introduction of IT in business: the Leavitt Diamond (Leavitt 1965) indicates that management cannot simply introduce IT into a process; rather, people, tasks, structure, and technology must all be changed, or at least considered. Indeed, the author (Davenport 1993, p. 13) proceeds to state that ". . . information technology is rarely effective without simultaneous human innovations."

Another view of IT's role in process redesign is provided by this same author, in terms of the nine *effects* that can be produced through IT (p. 51): 1) automational, 2) informational, 3) sequential, 4) tracking, 5) analytical, 6) geographical, 7) integrative, 8) intellectual, and 9) disintermediating. As an example from the emerging phenomenon of electronic commerce, IT is now employed to enable consumers to book airline flights directly (i.e., without the services of a travel agent) through the Internet World Wide Web (Southwest Airlines 1996); that is, one effect of "Web" technology has been to disintermediate the airline flight-booking process. This latter view serves to extend the simple approach of "thinking inductively" from above: whereas the inductive idea was to begin with certain *technologies*, and try to identify problems which they could help to solve, this latter idea begins with the *effects* of information technologies, which pertain to different ways in which processes can be transformed through redesign; clearly, consideration of IT effects on process performance brings one a substantial step closer to solving a redesign problem than simply considering the IT itself.

BPR FAQs Summary

The five BPR FAQs are listed in Table VII. To summarize briefly, FAQ 1 provides the key terms and concepts associated with the phenomenon of reengineering; central among these is the process as the fundamental unit of analysis in BPR, and the focus upon dramatic performance improvement through radical process redesign. FAQ 2 addresses the similarities and differences between BPR and TQM; despite differences in terms of scale, scope, and risk, BPR and TQM vary predominately in degree, and represent both compatible and complementary endeavors.

Table VII BPR FAQ Summary

FAQ	Summary
FAQ 1	Key terms and concepts?
FAQ 2	BPR & TQM differences?
FAQ 3	Why reengineer?
FAQ 4	Reengineering steps?
FAQ 5	IT role?

FAQ 3 follows directly from FAQ 2, in much the same manner that the BPR phenomenon of the Nineties followed the TQM movement that originated in the Eighties; that is, by asking the question, if we have TQM, why reengineer organizational processes? The myriad perspectives circle around the issue of competitiveness--firms reengineer either to keep up with performance improvements effected at rival firms that are reengineering, or in attempt to attain competitive advantages of their own.

FAQ 4 outlines the key steps from a number of expert reengineering methodologies, from which a divisive issue pertains to the analysis of an existing process baseline configuration; some experts note the importance of information that can be obtained through baseline analysis, whereas others exhort management to skip this step, and pursue a "clean slate" or "blank sheet of paper" approach. Of the methodologies that stress baseline process analysis, measurement is assigned a very important role. However, the nature of measurement in IT-enabled process redesign has a different emphasis from previous measurement focuses in TQM.

Finally, FAQ 5 addresses the role of IT in process redesign. Although IT is heralded as the central enabling technology for reengineering, the experts caution against the sole or excessive reliance on this transformation technology, and other enablers of process innovation such as human and organizational interventions are adduced. Drawing from the Leavitt Diamond Model, we are reminded that one cannot simply introduce IT into a process and expect the kind of dramatic performance improvements sought through reengineering; the colorful characterizations "automating the mess" and "paving the cowpaths" provide vivid reminders of this expert advice.

PREPARING FOR THE SECOND PHASE

As noted previously, the second phase of reengineering promises to be more challenging than the first. A key objective of this paper is to provide a summary of the BPR lessons learned from phase one, and the BPR FAQs above have been developed by drawing primarily from the class of expert reengineering methodologies. Together with the list of references below, this paper should serve as a useful review of BPR, helping both the academic and practitioner to focus his or her search through the reengineering literature. However, from the reengineering literary framework developed above, this present focus upon the expert reengineering methodologies clearly ignores the other classes of BPR publications. Because of the greater knowledge content inherent in academic investigations, preparations for the second phase of reengineering should also include a review of this class of the BPR literature.

As noted previously, the list of publications in the theory-building class of the literary framework was very, very short. Indeed, depending on interpretation, there may be no publications in this class. Although a number of propositions have been made regarding *how to* develop theory in the reengineering domain (e.g., using Socio-Technical Systems Design Theory; Saharia et al. 1994), the *actual development* of such theory represents an open area of current research. Research along this theory-building line offers great potential to help prepare for the second phase of reengineering, due particularly to the high knowledge content of any publications forthcoming from this class.

Advances in the practice of process redesign also merit attention. Leading BPR proponents assert that reengineering has now progressed, from mysterious art, to become a learnable craft (Hammer and Stanton 1995, p. xv). As a *learnable* craft, presumably the techniques for effective process redesign can be formalized and taught, not only by mystics and gurus, but on a systematic basis through our educational system (e.g., MBA and Executive programs). Such coursework can help to educate this and the next generation of managers to prepare for the second phase of reengineering.

Moreover, to the extent that the above techniques for effective process redesign can be formalized in a manner that integrates with computer-based inference, a good opportunity exists to capture and distribute expert reengineering knowledge through the methods of artificial intelligence (AI). Some preliminary measurement-based work along these lines has produced promising results (Nissen 1996), but a substantial amount of research is required to develop, test, and implement effective, operational, and "industrial-strength" knowledge-based systems (KBS) for redesign support. This represents another promising area of current research, as a huge amount of reengineering knowledge has been articulated, and available AI methods and technologies appear to be more than adequate for the job. The clearest beneficiaries of such redesign KBS will be the business practitioners, perhaps replacing the current dependence upon the $2 billion external reengineering consulting industry (Caldwell 1994). Alternatively, such an "intelligent" redesign system may also provide the BPR consultant with a source of competitive advantage. In either case, reengineering capabilities should improve, which can help to prepare for the second phase of reengineering.

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Table II Reengineering Literary Framework

Class of Publication
Trade Press answers the question *huh*?
Redesign Cases describe *who* and *which*
Expert Reengineering Methodologies motivate *whether* and prescribe *what*
Academic Investigations describe *how*
Theory-Building Works explain *why* and predict *when*

Table III Key Reengineering Concepts

Topic	Concept
Reengineering	Fundamental rethinking
	Radical redesign
	Process
	Dramatic improvement
	Measures
	Return
	Risk
Process	Activities
	Customers
	Measures
	Work ordering
	Time
	Space
	Beginning
	Ending
	Inputs
	Outputs
	Structure
	Action
	Baseline
Redesign	Process configuration
	Design flaws

Table IV High Level Reengineering Activities

1. Identifying processes for innovation
2. Identifying change levers
(i.e., enabling or transformation technologies)
3. Developing process visions
4. Understanding and improving existing processes
5. Designing and prototyping the new process

Table V Critical Redesign Activities

<u>Step 4 - Understanding and improving existing processes</u>

1. Describe the current process flow
2. Measure the process in terms of the new process objectives
3. Assess the process in terms of the new process attributes
4. Identify problems with or shortcoming of the process
5. Identify short-term improvements in the process
6. Assess current information technology and organization

<u>Step 5 - Designing and prototyping a new process</u>

1. Brainstorm design alternatives
2. Assess feasibility, risk, and benefit of design alternatives
3. Select the preferred process design
4. Prototype the new process design
5. Develop a migration strategy
6. Implement new organizational structures and systems

Table VI Eight Step Approach

1. Frame the project
2. Create vision, values and goals
3. Redesign business operations
4. Conduct proof of concept
5. Plan implementation
6. Get implementation approval
7. Implement redesign
8. Transition to CPI environment

Table VII IT Enablers

1. Shared databases
2. Expert systems
3. Telecommunications networks
4. Decision support tools
5. Wireless data communication and portable computers
6. Interactive videodisk
7. Automatic identification and tracking technology
8. High performance computing

Table VIII BPR FAQ Summary

FAQ 1 - Key Terms and Concepts?
FAQ 2 - BPR & TQM Differences?
FAQ 3 - Why Reengineer?
FAQ 4 - Reengineering Steps?
FAQ 5 - IT Role?

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BIOGRAPHICAL SKETCH

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